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NOISE POLLUTION ANALYSIS

Proposed Cannabis Campus
Shasta County APNs 006-020-056 & 057
2116 Ashby Road, Shasta Lake, CA 96019

December 19, 2019

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ATTACHMENT

Noise Pollution Analysis for Ashby Road – A Sound Engineering Study

Introduction

This study discusses potential noise and vibration impacts resulting from the development and operation of a proposed commercial cannabis cultivation, distribution, and manufacturing operation (“Project”) off of Ashby Road in the City of Shasta Lake, California on Shasta County APNs 006-020-056 & 057 (“Project Property”). The analysis is based on the review of existing resources, technical data, and applicable laws, regulations, and guidelines, as well as a Sound Engineering Study performed on the Project Property in June and July of 2019.

This report, generated by Realm Engineering, presents the results of our findings for the Project Property, referred to as the “Site”. The results will be used to show the evaluated existing conditions and to provide noise analysis and noise suppression recommendations at the Site, as well as to describe the expected noise pollution of the Site during construction and operation of the proposed commercial cannabis cultivation, distribution, and manufacturing operation.

Existing Conditions and Environmental Setting

The Project Property consists of two parcels totaling approximately 6.1 acres of land each. The site does not currently have an address but is located on Ashby Road in the City of Shasta Lake, Shasta County, California, and is further identified by APNs 006-020-056 and 057. The Project Property is currently undeveloped. Most of the Project Property is covered in Oak trees and annual grasses, which offer a natural sound barrier.

The Project Property is located west and directly adjacent to Ashby Road. Sierra Pacific Industries (SPI) industrial sawmill operation is located immediately north and northwest of the Project Property. Vacant industrial-zoned properties are located adjacent to the Project Property’s western and southern parcel boundaries. A residential neighborhood is located directly east of and across Ashby Road from the Project Property. Union/Southern Pacific Railroads’ railroad runs within 1,250 and 2,500 feet north and west (respectively) of the Project Property.

The Project Property is subjected to higher noise levels from roadway traffic on Ashby Road (east), railway traffic on Union/Southern Pacific Railroads’ railroad (north and west), and industrial activities from the sawmill operation located directly north and adjacent to the Project Property. Noise measurements performed in June and July of 2019, indicate average noise levels ranging between 48 dB and 77 dB on the Project Property. Noise measurements performed on the Project Property approximately 50 feet west of Ashby Road during this period, ranged between 40 dB and 87 dB. Noise measurements performed approximately 50 feet south of the Project Property’s northern boundary (directly adjacent to the sawmill operation) during this period, ranged between 44 dB and 83 dB.

For Reference

This section describes the existing setting in the Project Property/Site, and identifies the resources that could be affected by the proposed Project. Noise Pollution, typically defined as unwanted sounds, are perceived based on their loudness (i.e., volume or sound pressure level) or pitch (i.e., tonal or frequency content). The standard unit of measure for sound pressure levels is the decibel (dB). Sound pressures in the environment have a wide range of values and the sound pressure level was developed to describe this range as a logarithm of the sound pressure. The sound pressure level is the logarithm of the ratio of the unknown sound pressure to an agreed upon reference quantity. To account for the pitch of sounds and the corresponding sensitivity of human hearing to them, the raw sound pressure level is adjusted with an A-weighting scheme based on frequency that is stated in units of decibels (dBA). The A-weighting scale is appropriate because it is a close approximation of the human response to different frequencies of sound and is in broad use across many disciplines that address noise. The A-weighting scale attenuates low-frequency noises in a manner that simulates how human ears attenuate low-frequency noise at low levels (approximately 40 decibels (dB)). The A-weighting scale is the most common weighting scale for environmental acoustics analysis and assessing compliance with applicable noise limits. State and federal agencies that regulate environmental noise throughout the United States rely on the A-weighted decibel, or dB(A), as the appropriate metric for assessing human response to noise.

Different types of measurements are used to characterize the time-varying nature of sound.

Below are brief definitions of these measurements and other terminology used in this analysis.

- Sound - A vibratory disturbance created by a vibrating object that, when transmitted by pressure waves through a medium such as air, is capable of being detected by a receiving mechanism, such as the human ear or a microphone.
- Noise - Sound that is loud, unpleasant, unexpected, or otherwise undesirable.
- Decibel (dB) - A unitless measure of sound on a logarithmic scale, which indicates the squared ratio of sound pressure amplitude to a reference sound pressure amplitude. The reference pressure is 20 micro-pascals.
- A-Weighted Decibel (dBA) - An overall frequency-weighted sound level in decibels that approximates the frequency response of the human ear.
- Maximum Sound Level (L_{max}) - The maximum sound level measured during the measurement period.
- Minimum Sound Level (L_{min}) - The minimum sound level measured during the measurement period.
- Equivalent Sound Level (L_{eq}) - The equivalent steady state sound level that, in a stated period of time, would contain the same acoustical energy.

The decibel level of a sound attenuates (or decreases) exponentially as the distance from the source of that sound increases. Noise Pollution can have a substantial effect on the quality of life. An individual's reaction to a particular noise depends on many factors, such as the source of the noise, its loudness relative to the background noise level, and the time of day. The reaction to noise can also be highly subjective; the perceived effect of a particular noise can vary widely among individuals in a community.

Because of the nature of the human ear, a sound must be about 10 dBA greater than the reference sound to be judged as twice as loud. In general, a 3 dBA change in community noise levels is perceivable, while 1 to 2 dBA changes generally are not perceived. Although the reaction to noise can vary, it is clear that noise is a significant component of the environment, and excessively noisy conditions can affect an individual's health and well-being. The effects of noise are often only transitory, but adverse effects can be cumulative with prolonged or repeated exposure. The effects of noise can be organized into six broad categories: general annoyance, sleep disturbance, interruption of human performance and behavior, interruption of social interaction of communication, extra-auditory health effects, and permanent hearing loss. Noise-Sensitive Land Uses (NSLUs) include areas where an excessive amount of noise would interfere with normal activities. Primary NSLUs include residential uses, public and private educational facilities, hospitals, convalescent homes, hotels/motels, daycare facilities, and passive recreational parks.

Ground-borne Vibration propagates from the source through the ground to adjacent buildings by surface waves. Vibration may be composed of a single pulse, a series of pulses, or a continuous oscillatory motion. The frequency of a vibrating object describes how rapidly it is oscillating, measured in Hertz (Hz). The normal frequency range of most ground-borne vibration that can be felt generally starts from a low frequency of less than 1 Hz to a high of about 200 Hz. Vibration energy spreads out as it travels through the ground, causing the vibration amplitude to decrease with distance away from the source. Ambient and source vibration are often expressed in terms of the peak particle velocity (PPV) or root mean square (RMS) velocity in inches per second that correlates best with human perception. The Federal Transit Administration (FTA) estimates that the threshold of perception is approximately 0.0001 inches/second RMS and the level at which continuous vibrations begins to annoy people is approximately 0.001 inches/second RMS. Ground-borne vibration can disrupt Vibration-Sensitive Land Uses (VSLUs) by causing movement of buildings, rattling of windows and items inside buildings, rumbling sounds, and even property damage. VSLUs include buildings where vibration would interfere with operations within the building, such as vibration-sensitive research and manufacturing, hospitals with vibration-sensitive equipment, and university research operations. The degree of sensitivity to vibration depends on the specific equipment that would be affected by the vibration. Residential uses are also sensitive to excessive levels of vibration of either a regular or an intermittent nature. According to the Transit Noise and Vibration Impact Assessment (FTA 2006), background vibration level in residential areas is typically 0.00003 inches/second RMS, which is lower than 0.0001 inches/second RMS, the threshold of perception for humans.

Policies and Regulations

California General Plan Guidelines

California Government Code Section 65302(f) requires that cities and counties include a noise element in their general plans. The purpose of the noise element is to provide a guide for establishing a pattern of land uses that minimizes the exposure of community residents to excessive noise. The Office of Planning and Research has published general plan guidelines that include guidelines for noise land use compatibility.

Local Policies and Regulations

The City of Shasta Lake’s General Plan includes a Noise element, which outlines Objectives, Policies, and Implementation Measures that are designed to protect Noise-Sensitive Land Uses (NSLUs) of the City through the regulation of new noise-generating development, protect new NSLUs from existing and future noise generators, and protect established noise-generating development from new NSLUs. The proposed Project will be a non-NSLU located within an industrial area of the City of Shasta Lake, surrounded by other non-NSLUs, but directly west of and across Ashby Road from a residential area (NSLU). The residences along Ashby Road, which are most likely to be affected by noise generated from the proposed Project, are single-family dwellings. Per the Noise Sensitivity Standards outlined in Table N-1 of the City of Shasta Lake’s General Plan, the proposed Project cannot generate noises in excess of 60-65 dB as observed within the Outdoor Activity Areas of those residential properties (backyards of single-family dwellings), or 45 dB as observed within those residences.

Expected Construction Noise

The proposed Project will generate substantially more sound/noise during construction/development (vs. operation), with the construction of access roads, water line trenching, sewer line trenching, cut/fill grading, concrete pad construction, electrical trenching and wood frame construction. The residential neighborhood east of Ashby Road is the NSLU with the greatest potential to be impacted by sounds/noises from construction of the proposed Project. Noise generated by construction operations during the more noise-sensitive early morning, evening, and nighttime hours, can result in increased annoyance and potential sleep disruption for occupants of nearby dwellings. The US Environmental Protection Agency has found that the average noise levels associated with construction activities typically range from approximately 76 dBA to 84 dBA L_{eq} , with intermittent individual equipment noise levels ranging from approximately 75 dBA to more than 88 dBA for brief periods (U.S. EPA, 1971). The following table lists typical uncontrolled noise levels generated by individual pieces of construction equipment at a distance of 50 feet (FTA, 2006).

Equipment	Typical Noise Level (dBA) 50 Feet from Source
Backhoe	80
Compactor	82
Concrete Truck/Mixer	85
Crane, Mobile	83
Dozer	85
Excavator	85
Loader	85
Saw	76

Noise from localized point sources (such as construction sites) typically decreases by approximately 6 dBA with each doubling of distance from source to receptor. All NSLUs in the area of the proposed Project are located east of Ashby Road, while all construction activities will occur on the Project Property west of Ashby Road. Therefore, the residences and outdoor activity areas of the NSLUs most likely to be affected by the proposed Project, are located more than 50 feet from the construction activities associated with development of the proposed Project. Furthermore, the vast majority of construction activities will occur in the western half of the Project Property, more than 650 feet from the NSLUs east of Ashby Road, and the existing oak forest(s) in the eastern half of the Project Property will be largely untouched by the proposed Project (research has indicated that trees and shrubs can reduce propagation of noise, however their effectiveness at noise reduction varies greatly).

Strict adherence to the Construction Noise Abatement measures outlined below, will be necessary during the initial phase of construction along Ashby Road. Sound generated from construction activities will naturally attenuate to less than 65 dBA at Ashby Road, as construction activities move west and away the NSLUs of the nearby residential neighborhood. For example, if noise from a localized point source typically decreases by approximately 6 dBA with each doubling of distance from source to receptor, an excavator in the western half of the Project Property producing an uncontrolled noise level of 85 dBA at 50 feet, will be measured/perceived as 67 dBA at Ashby Road (750 feet away). This example does not take into account additional noise reduction from the forest(s) and a small hill in the eastern portion of the Project Property, nor the fact that construction equipment will be equipped with noise-reduction intake and exhaust mufflers and engine shrouds. Furthermore, noise generated by construction of the proposed Project will be comparable to the noise generated from traffic on Ashby Road, which averaged between 48 dB and 58 dB during the Sound Engineering Study, with maximum measurements of 60 dB to 85 dB (measured on the Project Property 50 feet from Ashby Road).

Construction Noise Abatement

The following abatement procedures are being proposed to help dull the initial startup construction noise.

1. The project is proposing to leave existing tree stands on each parcel to use as a natural barrier to help with noise abatement.
2. Noise-generating construction activities will only occur during the City of Shasta Lake's official working hours for construction and operation (between 7 AM and 7PM, Monday through Saturday, excluding Sundays and Federal/State Holidays).
3. Noise-generating construction activities in the eastern half of the Project Property, will only occur between 8AM and 6PM, Monday through Friday.
4. Construction equipment will be properly maintained and equipped with noise-reduction intake and exhaust mufflers and engine shrouds, in accordance with manufacturers' recommendations.
5. Stationary equipment (power generators, compressors, etc.) will be located at the furthest practical distance from nearby NSLUs.

6. Wildlife pre-construction surveys will be performed per the Biologist Report.
7. Tree Cutting Practices will be followed within the Arborist Report to help contain anticipated construction noise.
8. Installation of a Gate and Solid slatted fence to abate construction noise will be recommended as a condition.
9. Landscaping planted near the frontage of Ashby Road for natural buffers against operation noise will be recommended as a condition.

Expected Operation Noise

The proposed F1 Occupancy Use of the parcels will have small amounts of outside activity. The bulk of the operations will be conducted on the interior of the buildings. The operation expects daily deliveries to the site and a moderate number of employees needed to be on the site everyday. Occasional landscape maintenance activities and monthly wash-downs (outside activities) will generate small amounts of operational noise that will be less than significant, when compared to the noise-generating uses surrounding the Project Property.

Operation Noise Abatement

No operation noise abatement measures are needed. Most noise-generating activities of the proposed Project will occur indoors, and far from NSLUs. Noise-generating activities to occur outdoors (such as landscape maintenance) will occur during the City of Shasta Lake's official working hours for construction and operation.

Impacts and Mitigation Measures

Impact NOI-1: Potential for construction-related noise from the project to exceed thresholds (less than significant with mitigation). Noise from construction activities includes noise from grading, excavation, and other earthmoving activities. Construction noise also results from machinery and equipment used in the construction process. The distance between NSLUs and the proposed Project, combined with the existing terrain and forest(s) of the Project Property, will act as a buffer against the majority of noise-generating activities which will occur in the western half of the Project Property. Noise-generating activities to occur in the initial phase of Project development/construction, will occur close to NSLUs and east of the small hill and forest(s) of the Project Property. Therefore, additional mitigation measures (below) will be required when working in the eastern half of the Project Property.

Mitigation 1: Noise-generating activities to occur in the eastern half of the Project Property, will only be conducted between the hours of 8AM and 6PM, Monday through Friday.

Mitigation 2: Construction equipment will be properly maintained and equipped with noise-reduction intake and exhaust mufflers and engine shrouds, in accordance with manufacturers' recommendations. Noise-reduction equipment on each piece of construction equipment, will be inspected each morning before start-up, when working within the eastern half of the Project Property.

Mitigation 3: No stationary noise-generating equipment will be staged in the eastern half of the Project Property.

Impact NOI-2: Potential for exposure of existing residences to operational noise (less than significant). Forest(s) in eastern half of Project Property will be maintained as a natural barrier to sound between the proposed Project and neighboring NSLUs. Installing a solid fence and gate with landscaping along the frontage of Ashby Road will further attenuate the operation and construction noise.

Impact NOI-3: Potential for construction-related noise from the project to exceed thresholds for wildlife (less than significant). Per the Wildlife Biological report, a qualified Biologist will perform a pre-construction survey for nesting raptors and special status species.

References

City of Shasta Lake. *City of Shasta Lake General Plan*. 1999

United States Department of Transportation, Federal Transit Administration (FTA). *Transit Noise and Vibration Impact Assessment*. 2006

United States Environmental Protection Agency (EPA). *Noise from Construction Equipment and Operations, Building Equipment, and Home Appliances*. 1971

NOISE POLLUTION ANALYSIS FOR ASHBY RD

A SOUND ENGINEERING STUDY

**Performed by Gary R. Moore for Realm Engineering
June 27 – July 2, 2019**

This sound study was performed over the course of 4 days by Gary Moore and Kyle Defoer for Realm Engineering in Redding California. This study was done in the City of Shasta Lake just south of the Sierra Pacific Industries and west of Ashby Rd. This location has no address and is identified by APN 006-020-056 and 57.

Instruments used for this study included:

ABC Apps Sound Meter – This sound level meter (or SPL) records and shows decibel values by measuring environmental noise. The firmware for this application was updated on June 25, 2019.

External Android plug in field microphone with a “dead Cat” wind protection sock.

AKG 414 Professional Condenser microphone

Marantz Professional Solid State Recorder – XLR input, phantom power

Manfrotto Professional Tripods and mic stands

CONCEPT AND EXECUTION

This study encompassed 5 specific areas of measure on the property and are defined here:

SECTOR 1 - North entry gate to the property West of Ashby Rd

SECTOR 2 – Midline between North and South entry gates West of Ashby Rd

SECTOR 3 - South entry gate to the property West of Ashby Rd

SECTOR 4 - South of Sierra Pacific property line -West Boundary in relation to Ashby Rd

SECTOR 5 - South of Sierra Pacific property line – East Boundary in relation to Ashby Rd.

Measurements in all sectors were recorded and documented in 15 minute increments at distances of 50, 100, 150 and 200 feet. The attached report shows measurements in decibels for minimum, maximum and average sound levels. Additional notes are included regarding conditions that had any effect on measurements.

ASHBY PROJECT SOUND STUDY – JUNE 27TH 2019

	LOCATION	DATE	TIME Pst	MIN Db	MAX Db	AVERAGE Db
SECTOR 1	50' West of Ashby Rd	6/27/19	9-915	46	85	58
	100' West of Ashby Rd	6/27/19	930-945	46	78	53
	150' West of Ashby Rd	6/27/19	10-1015	47	79	55
	200' West of Ashby Rd	6/27/19	1030-1045	44	76	53
SECTOR 2	50' West of Ashby Rd	6/27/19	12-1215	46	80	57
	100' West of Ashby Rd	6/27/19	1230-1245	43	77	56
	150' West of Ashby Rd	6/27/19	1-115	44	78	56
	200' West of Ashby Rd	6/27/19	130-145	46	77	54
SECTOR 3	50' West of Ashby Rd	6/27/19	2-215	43	85	53
	100' West of Ashby Rd	6/27/19	216-231	44	78	54
	150' West of Ashby Rd	6/27/19	235-250	42	75	50
	200' West of Ashby Rd	6/27/19	253-308	42	79	54

ASHBY PROJECT SOUND STUDY – JUNE 28TH 2019

	LOCATION	DATE	TIME Pst	MIN Db	MAX Db	AVERAGE Db
SECTOR 1	50' West of Ashby Rd	6/28/19	1232-1247	42	60	53
	100' West of Ashby Rd	6/28/19	1248-103	43	80	57
	150' West of Ashby Rd	6/28/19	115-130	44	81	55
	200' West of Ashby Rd	6/28/19	132-147	42	75	52
SECTOR 2	50' West of Ashby Rd	6/28/19	830-845	44	83	52
	100' West of Ashby Rd	6/28/19	848-903	46	78	58
	150' West of Ashby Rd	6/28/19	907-922	48	76	56
	200' West of Ashby Rd	6/28/19	925-940	48	74	55
SECTOR 3	50' West of Ashby Rd	6/28/19	945-1000	42	82	52
	100' West of Ashby Rd	6/28/19	1014-1029	39	78	52
	150' West of Ashby Rd	6/28/19	1030-1045	41	74	49
	200' West of Ashby Rd	6/28/19	1050-1105	41	73	50

ASHBY PROJECT SOUND STUDY – JULY 1ST 2019

	LOCATION	DATE	TIME Pst	MIN Db	MAX Db	AVERAGE Db
SECTOR 1	50' West of Ashby Rd	7/1/19	1126-1141	41	79	54
	100' West of Ashby Rd	7/1/19	1143-1158	42	81	52
	150' West of Ashby Rd	7/1/19	1200-1215	43	75	52
	200' West of Ashby Rd	7/1/19	1220-1235	43	80	53
SECTOR 2	50' West of Ashby Rd	7/1/19	130-145	48	79	57
	100' West of Ashby Rd	7/1/19	200-215	49	78	59
	150' West of Ashby Rd	7/1/19	218-233	45	72	52
	200' West of Ashby Rd	7/1/19	236-251	45	75	51
SECTOR 3	50' West of Ashby Rd	7/1/19	1015-1030	40	78	48
	100' West of Ashby Rd	7/1/19	1033-1048	39	72	50
	150' West of Ashby Rd	7/1/19	1050-1105	41	74	51
	200' West of Ashby Rd	7/1/19	1107-1122	41	74	52
SECTOR 4	50' South of SP WB	7/1/19	300-315	65	79	72
	100' South of SP WB	7/1/19	316-331	65	75	68
	150' South of SP WB	7/1/19	333-348	62	88	77
	200' South of SP WB	7/1/19	350-405	62	87	70
SECTOR 5	50' South of SP EB	7/1/19	415-430	44	83	59
	100' South of SP EB	7/1/19	431-446	47	80	58
	150' South of SP EB	7/1/19	450-505	46	83	59
	200' South of SP EB	7/1/19	506-521	46	70	52

ASHBY PROJECT SOUND STUDY – JULY 2ND 2019

	LOCATION	DATE	TIME Pst	MIN Db	MAX Db	AVERAGE Db
SECTOR 1	50' West of Ashby Rd	7/2/19	125-140	43	83	57
	100' West of Ashby Rd	7/2/19	141-156	44	82	58
	150' West of Ashby Rd	7/2/19	159-214	47	79	60
	200' West of Ashby Rd	7/2/19	215-230	45	70	52
SECTOR 2	50' West of Ashby Rd	7/2/19	231-246	43	84	57
	100' West of Ashby Rd	7/2/19	248-303	43	79	53
	150' West of Ashby Rd	7/2/19	323-338	43	78	54
	200' West of Ashby Rd	7/2/19	306-321	44	74	52
SECTOR 3	50' West of Ashby Rd	7/2/19	405-420	45	82	55
	100' West of Ashby Rd	7/2/19	422-437	46	87	60
	150' West of Ashby Rd	7/2/19	438-453	47	84	57
	200' West of Ashby Rd	7/2/19	454-509	46	75	54
SECTOR 4	50' South of SP WB	7/2/19	1008-1023	69	80	74
	100' South of SP WB	7/2/19	1026-1041	61	75	64
	150' South of SP WB	7/2/19	1043-1058	62	71	65
	200' South of SP WB	7/2/19	1100-1115	63	83	68
SECTOR 5	50' South of SP EB	7/2/19	1119-1134	61	80	69
	100' South of SP EB	7/2/19	1137-1152	66	76	70
	150' South of SP EB	7/2/19	1154-1209	62	74	66
	200' South of SP EB	7/2/19	1212-1227	30	78	64



006040017

006040007

006030034

SPI Industrial Sawmill Operation

Central Valley

Sector 4

Sector 5

006020059

006040013

PROJECT PROPERTY

006020057

006020058

006030035

Vacant Industrial-zoned Properties

006920045

Sector 1

Sector 2

Sector 3

006020056

Noise-Sensitive Land Uses
(Residential Neighborhood)

006020025

006020002

006020046

006010009

006020037

ALBANY RD 006020043

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community